This PDF is a selection from a published volume from the National Bureau of Economic Research

Volume Title: Measuring and Managing Federal Financial Risk

Volume Author/Editor: Deborah Lucas, editor

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-49658-9

Volume URL: http://www.nber.org/books/luca07-1

Conference Date: February 8-9, 2007

Publication Date: February 2010

Chapter Title: Guaranteed versus Direct Lending: The Case of Student Loans

Chapter Author: Deborah Lucas, Damien Moore

Chapter URL: http://www.nber.org/chapters/c3038

Chapter pages in book: (163 - 205)

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# Guaranteed versus Direct Lending
## The Case of Student Loans

Deborah Lucas and Damien Moore

### 7.1 Introduction

The federal government makes low-cost financing for higher education widely available through its fast-growing student loan programs. The existence of two competing government programs—the Federal Family Educational Loan Program (guaranteed program) and the Federal Direct Loan Program (direct program)—provides a unique opportunity to compare the cost to the government of direct federal lending versus loan guarantees.

Both the direct and guaranteed student loan program offer their borrowers very similar loan products and terms, but the programs differ significantly from the perspective of other key stakeholders, including educational institutions, commercial lenders, and state guarantee agencies. The programs also have widely divergent budget costs: The Fiscal Year (FY) 2007 budget records a 2 percent subsidy rate on direct loans, versus a subsidy rate of 10 percent for the guaranteed program.

In this study, we propose and implement a methodology to provide a comprehensive cost estimate for the two programs in market value terms, and analyze the sources of the differential. There are several reasons for emphasizing market values. Arguably, they are the best estimate of the cost of federal obligations from the perspective of taxpayers. Increasingly,

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We thank Marvin Phaup and Janice Eberly for many helpful comments and suggestions. The views expressed are not necessarily those of the Congressional Budget Office. Lucas gratefully acknowledges the support of the Searle Foundation.

federal and local government agencies incorporate market valuation principles in cost-benefit analyses (e.g., Gramlich 1990). Further, almost all noncredit transactions—including grants, purchases of goods, and the direct provision of services—appear in the budget at market prices (Lucas and Phaup, chapter 3 in this volume). In the context of improving access to higher education, outright grants are the main alternative to subsidized loans. The omission of certain costs for loans and loan guarantees understates their true cost to taxpayers, and artificially favors expanding the student loan programs over funding for grants.

Obtaining market value estimates allows us to address the question of how much of the difference in reported subsidy rates can be attributed to real cost differences between the programs, and how much is due to idiosyncrasies in the rules for budgeting federal credit. To preview the main results, we find that budget costs for both programs are well below their market value. This is mostly attributable to budget rules that require discounting expected net cash flows at Treasury rates. Understatement of the market cost of capital also accounts for why some direct loans appear to make money for the government, despite the favorable terms offered to borrowers. Administrative costs are accounted for inconsistently across programs, with some costs of the direct program not incorporated into the subsidy rate.

Even after adjusting for the market cost of capital, asymmetric treatment of administrative costs, and other inconsistencies in how the programs are budgeted for, the guaranteed program appears to be fundamentally more expensive than the direct program. Adjusting for the cost of risk has little effect on the differential, since the government bears most of the credit risk in either case. The differential can be attributed primarily to the fact that guaranteed lenders are paid more than is required to induce them to lend at statutory terms. The excess payments appear to be partially absorbed in competition for borrowers, which occurs through various discounts, marketing activities, and higher service levels and subsidies to educational institutions. To the extent that the market is not perfectly competitive, guaranteed lenders presumably are able to retain some of the surplus. The direct program also has a real cost advantage. As well as lower administrative costs, the direct program has the advantage of raising funds via the Treasury rather than through private financial institutions. The size of the Treasury's apparent advantage, and whether it should be considered a real cost saving, is also discussed.

In light of its cost disadvantage, a natural question is whether the guaranteed program provides offsetting benefits. In principal, private intermediaries can add value; for instance, through better screening or monitoring of borrowers. Student loans, however, have categorical entitlement and an almost full credit guarantee, making the value added by private intermediation less obvious. Beyond loan administration, the guaranteed program channels money and services to students, schools, and guarantee agencies,

but these transfers might be better targeted and controlled if they were separated from the lending function.

The rest of the chapter is organized as follows. Section 7.2 provides an overview of federal student loan programs: their size, product offerings, the roles of various stakeholders, and their market structure. Section 7.3 describes how student loans and loan guarantees are budgeted for; how these rules lead to budget estimates that are inconsistent with market valuation; and the decomposition of costs in the budget. In section 7.4 we discuss the private student market and the information it provides on the market cost of capital and the composition of administrative costs. In section 7.5 we turn to the central problem of estimating the market cost of the direct and guaranteed loan programs. The resulting market value estimates are presented and subjected to sensitivity analysis. Section 7.6 assesses cost from the perspective of guaranteed lenders. Section 7.7 concludes with a discussion of some of the broader policy questions raised by the analysis, and of the implications of the recent financial crisis for the student loan market.

## 7.2 Overview

The Department of Education (ED) oversees two competing student loan programs: the Federal Family Education Loan (FFEL, or guaranteed) program, and the William D. Ford Federal Direct Loan (direct loan) program. In the guaranteed program, which dates back to the mid-1960s, the government guarantees loans originated by private lenders against losses from default and makes supplemental payments to lenders. In the direct program, which began operation much more recently in 1994, the government directly lends to qualifying students.

### 7.2.1 Program Size

The federal student loan program is one of the largest credit programs operated by the US government. Table 7.1 shows the rapid growth in total federally-backed student loans outstanding, which in 2005 totaled over $380 billion. Statistics compiled by the Department of Education indicate that in the same year, about 6.8 million students, and 750,000 parents of students, borrowed $56 billion in new federally-backed loans. The guaranteed program was responsible for 77 percent of this new loan volume. Another 2.5 million borrowers took advantage of the option to convert their outstanding Stafford loans into more favorable consolidation loans, resulting in $69.6 billion of new consolidation loans.

### 7.2.2 Product Offerings and Loan Terms

Both the direct and guaranteed programs offer three basic types of loans: Stafford Loans, Parent Loans to Undergraduate Students (PLUS), and

**Table 7.1** **Federal student loans outstanding, 1998–2005**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| FFEL | | | | | | | | |
| Unconsolidated (Stafford and PLUS) | 74,727 | 92,760 | 106,220 | 122,423 | 129,757 | 130,455 | 142,405 | 148,391 |
| Consolidated | 9,675 | 20,008 | 27,891 | 32,384 | 49,434 | 79,017 | 100,176 | 138,457 |
| Subtotal | 84,402 | 112,768 | 134,111 | 154,807 | 179,191 | 209,472 | 242,581 | 286,848 |
| Direct | | | | | | | | |
| Unconsolidated (Stafford and PLUS) | 26,937 | 33,763 | 43,091 | 47,958 | 50,264 | 51,013 | 52,090 | 47,679 |
| Consolidated | 4,733 | 12,067 | 14,622 | 22,526 | 29,807 | 33,507 | 37,155 | 47,027 |
| Subtotal | 31,670 | 45,830 | 57,713 | 70,484 | 80,071 | 84,520 | 89,245 | 94,706 |
| Total | 116,072 | 158,598 | 191,824 | 225,291 | 259,262 | 293,992 | 331,826 | 381,554 |

*Source:* OMB, as reported in the budget appendix.

Consolidation loans. We restrict the analysis to Stafford and Consolidation loans, since these comprise the vast majority of loans in both programs.

The terms on all loans are set by statute under the Higher Education Act. From the perspective of students, the terms on Stafford and Consolidation loans are virtually identical under both the direct and guaranteed programs. Government payments to and from guaranteed lenders are also set by statute, and differ across loan types.

### *Stafford*

These ten- to thirty-year loans are available to students enrolled in eligible educational institutions, which includes most US colleges and universities but not trade or for-profit schools. Between 1998 and July 2006, these loans carried a floating rate that reset annually, based on the three-month Treasury rate plus a fixed spread. Since July 2006, Stafford loans carry a fixed 6.8 percent per annum interest rate, with flexible repayment plans that begin upon completion or dropping out of a course of study.[1] Borrowers in the guaranteed program are assessed a onetime 2 percent origination fee, although this may be paid by the lender.[2] Borrowers pay a further 1 percent guarantee fee at origination that accrues to guaranty agencies in the guaranteed program. In the direct program borrowers are charged 3 percent upfront, although they can receive a 1.5 percent rebate for an on-time first payment.[3]

Although all Stafford loans carry below-market rates, the loans are further classified as "subsidized" or "unsubsidized." The federal government pays all of the accrued interest on subsidized Stafford loans while a borrower

1. From July 2008, the rate on new loans is scheduled to decline in gradual increments until it reaches 3.4 percent in July 2011 before reverting to 6.8 percent in July 2012, at which time the Higher Education Act comes up for reauthorization. The analysis here is based on the rules in effect from August 2006 to June 2007.

2. Under current law, the origination fee phases out over the next several years.

3. Historically, the guarantee fee has also been waived, but this is no longer the case.

is in school, grace period, or deferment, whereas interest accrues on unsubsidized loans. Eligibility for subsidized loans is based on income.

On Stafford loans, guaranteed lenders receive special allowance payments (SAP) from the government that provide net cash flows (including payments from students) equal to the three-month commercial paper rate plus a fixed spread. The spread is 1.74 percent while students are in school and 2.34 percent when loans are in repayment. The spread is primarily compensation for administrative costs rather than risk, since lenders also are reimbursed for 97 to 99 percent of principal and accrued interest on loans that default, and the commercial paper (CP) rate is approximately the cost of capital for federally guaranteed loans (see section 7.4.1, subsection "Capital Cost for Guaranteed Loans"). Net payments to lenders are reduced by a onetime, 50 basis point origination fee assessed on lenders.[4] Guaranty agencies receive 40 basis points (bps) of this origination fee, reducing the net federal cash inflow to 10 basis points.

*Consolidation*

Borrowers with one or more Stafford loans may replace them with a single Consolidation loan any time after completing their course of study. Consolidation loans offer a new repayment plan and a fixed interest rate equal to the weighted average of interest rates on the underlying Stafford loans rounded up to the nearest eighth of a percentage point. Thus, the portion of post-July 2006 Stafford loans that are consolidated will carry a rate slightly above 6.8 percent. Consolidation loans now offer a similar set of flexible repayment terms as do Stafford loans, but in the past also provided additional repayment extension options.

Guaranteed lenders receive lower compensation from the government for Consolidation than for Stafford loans. For Consolidation loans, the spread over the three-month commercial paper rate, net of fees, is 1.59 percent. In addition, they pay a further origination fee of 50 bps, of which 40 bps goes to the guaranty agencies. Despite generating less income than Stafford loans, the net return on the loans is generally positive, and competition to offer these loans until recently has been brisk. However, it appears that guaranteed lenders avoid consolidating distressed loans, since a disproportionate share of distressed loans is consolidated into the direct loan program.

### 7.2.3 Stakeholders

Students and parents of students pursuing post-secondary degrees are direct beneficiaries of these programs, which lower the cost and increase the availability of funding for higher education. Unsubsidized Stafford loans are not means-tested, and borrowing limits are tied to educational expenses, which are higher at private and four-year institutions. Hence, students from

4. This fee will increase to 1 percentage point beginning October 2007.

middle- and upper-income-class families receive a large share of total program benefits. From an economic perspective, loan assistance can be welfare improving when imperfections in private credit markets limit access to education, or when education has significant positive externalities.[5] A caveat is that some students may take on an excessive amount of debt to pay for degrees that add little to their earning potential.

Educational institutions also depend on federal student loan programs for financial support. Without assistance, many students would be unable or unwilling to pay the high tuition charges at many schools.[6] To a lesser extent, schools benefit directly if they elect to participate in the guaranteed loan program. Guaranteed lenders offer schools various types of support in exchange for featuring their loans, including educational grants and administrative, educational, and systems support to financial aid offices. In "school as lender" programs, where the educational institution itself takes on the origination role, the school retains the excess of government payments over its cost of extending credit.

The guaranteed loan industry—lenders, servicers, and guarantee agencies—also have a large stake in the program. Providing financing for guaranteed student loans has been a profitable line of business for guaranteed lenders, although competition in the industry has intensified over time. Although there are more than 3,500 for-profit and not-for-profit lenders, the market is dominated by a few large for-profit players, including the leading commercial banks and Sallie Mae. Sallie Mae, by far the largest guaranteed lender, began as a government-sponsored enterprise but now is fully privatized.

State and private nonprofit guaranty agencies administer the federal guarantee and provide services to schools and lenders. As of 2006, there were thirty-five active guaranty agencies, some operating in multiple states. Each guaranty agency maintains an account in federal trust, which is used to pay out claims from lenders. Those funds are replenished by the federal government. Guaranty agencies also receive federal funds for performing collection activities, historically as high as 25 percent of the recovered amounts (even if the amount was recovered through federal loan consolidation). The agencies may use their share of collections to fund scholarships, education outreach programs, and default aversion activities.

### 7.2.4 Market Structure

To evaluate the costs associated with lending and the likely disposition of the rents created when government payments exceed the cost of guaranteed

5. Several studies question the effectiveness of such policies; for example, De Fraja (2002), Dynarski (2002), Edlin (1993), Hanushek (1998), and Keane (2002). Gale (1991) points out that many federal credit programs probably have a small real effect on the allocation of credit, in many cases simply crowding out private borrowing and lending.

6. Some have argued that the generous borrowing limits in the federal student loan program have accommodated the growth in college tuition, which has exceeded the growth of the overall economy.

lending, it is necessary to understand how the market for student loans is organized and the extent to which it is competitive.

Schools have a choice of whether to participate in the direct or guaranteed loan program, and all of its students must borrow through that program. Simultaneous participation in both programs is not permitted, but a school can elect to switch programs and some choose to do so.[7] Competition for volume between the two programs therefore centers on school administrators, particularly financial aid officers. Recall that both programs offer students nearly identical loan terms, so differentiation occurs primarily along other dimensions. The direct program offers greater administrative simplicity, which initially attracted many schools to the program. Guaranteed lenders responded by offering schools and borrowers improved service and other inducements, and since the late 1990s the guaranteed program has slowly regained market share (see figure 7.1).

Competition also takes place at the school level between guaranteed lenders. Although there are thousands of lenders potentially competing for borrowers' business, at the individual institutions competition is much more limited. The financial aid office serves as a gatekeeper, counseling students who seek advice, and only including a limited number of lenders on its "preferred lender list."[8] Most students have little financial experience and rely on the advice of the school, although direct-to-student marketing of loan products has become more common, and some students venture beyond the preferred lender list.

The market for consolidation loans is more competitive because borrowers are free to choose between the direct program and any guaranteed lender. In recent years, very favorable terms on consolidation loans led to high rates of consolidation and the entry of competitive new entrants into the consolidation business. Under the new fixed rate regime, consolidation is less advantageous to students, and since it is also financially disadvantageous to Stafford lenders, its prevalence has been declining.

We conclude that because of the active competition between guaranteed lenders to capture volume, it is likely that all but the most efficient lenders retain little in the way of abnormal profits. The gatekeeper role of schools further suggests that they are in a position to capture a large portion of rents, but those may be passed through to students through scholarships, expanded program offerings, or other means. The common practice of lenders paying all or part of the origination fee for students and offering benefits like discounts for on-time payments is direct evidence that some of the rent

7. A single university may have some schools participating in the direct program and others using the guaranteed program.

8. Northwestern University provides a fairly typical example. It includes five major lenders on its preferred list for undergraduate students. It does not officially rank them, but Citibank holds the coveted first position on the (nonalphabetical) list. The preferred lender lists for its various graduate and professional schools are shorter. The business, law, and medical schools offer only three options, with the first one being Northwestern University itself. Only two lenders are recommended to students pursuing part-time MBAs.

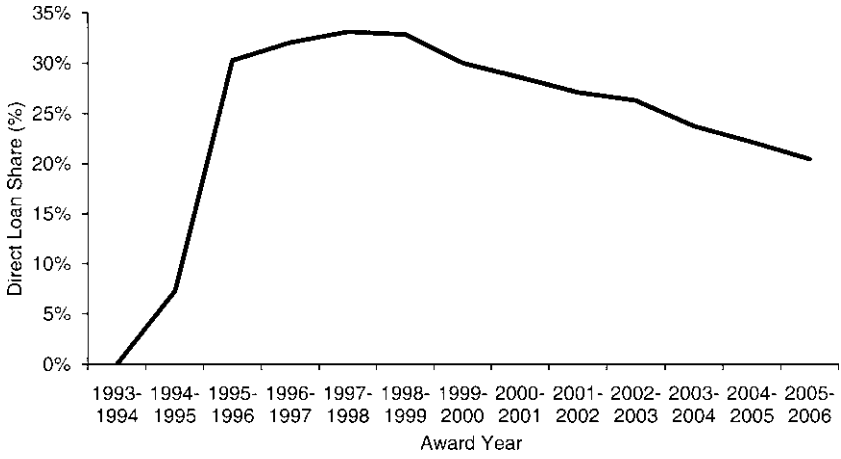


**Fig. 7.1 The direct program share of new federal student(?) loan volume**
*Source:* The Department of Education.

goes directly to students. Some rents, however, are absorbed by marketing costs and inducements to schools and financial aid officers that seem unlikely to provide much benefit to students.

## 7.3 Budget Estimates

Most analyses of the cost difference between the direct and guaranteed loan programs rely on budget estimates prepared by the Congressional Budget Office (CBO) and the Office of Management and Budget (OMB). Although the underlying premise of this study is that market value estimates offer a more accurate representation of cost than do budget estimates, the budget provides a useful and more familiar starting point for evaluating program cost. In this section we describe the rules governing budgeting for credit, noting where they deviate from market valuation principles. We also discuss what budget estimates reveal about the breakdown of cost for the two programs, and how those comparisons can be misleading.

### 7.3.1 Budgeting for Federal Student Loan Programs

Before 1990, credit, like most other government programs, was accounted for on a cash basis. Under cash basis accounting, new direct loan programs have a very high up-front cost since the loan principal is recorded as a cash outflow. In contrast, loan guarantees initially can appear to make money, since fees are paid up-front but the cash flows associated with defaults may not materialize for many years. The Federal Credit Reform Act of 1990 (FCRA) made the treatment of direct and guaranteed loans more symmetric

by effectively putting credit on an accrual basis, with cost measured as a net discounted value of expected current and future cash flows associated with the current year commitment.

Federal budget rules have had a significant effect on the structure and evolution of the federal student loan programs. Most notably, the direct student loan program appears to have been made feasible from a budgetary perspective by FCRA. Proposed on several occasions in the late 1980s, direct lending's high initial cash cost was a decisive obstacle. The direct loan program was enacted in 1993, shortly after the FCRA went into effect.

### 7.3.2 Budget Cost versus Market Cost

Before turning to the budget estimates, it is important to understand in general terms why those numbers are systematically lower than the market value estimates of cost presented later on. The main reason for the downward bias is that FCRA mandates using maturity-matched Treasury rates without risk adjustment for discounting. This practice makes both direct and guaranteed loans appear less costly to the government than when discounting at market rates.

The omission of certain administrative costs further lowers budget estimates relative to comprehensive market value estimates. In addition, administrative costs are accounted for inconsistently across the two programs. Most administrative costs associated with guaranteed loans are included in the reported subsidy rate. By contrast, administrative costs in the direct program are accounted for separately and on a cash basis, and so are not included in subsidy estimates.[9]

A discrepancy between budget and market cost also arises from CBO's budgetary treatment of floating rate loans.[10] The CBO interprets FCRA as requiring the use of final maturity-matched Treasury rates for discounting, whereas market valuations reflect the shorter effective maturity of floating rate loans, which equals the time to the next rate reset. Because of the term premium in long-term rates, this tends to bias down federal estimates of floating rate direct loan value relative to their market value. Although the switch to fixed rates for new student loans after June 2006 reduces this distortion prospectively, federal payments to guaranteed lenders still depend

9. Administrative costs for most federal loan programs are accounted for separately on a cash basis, and hence do not appear in subsidy rates.

10. This misvaluation has potential real effects. For instance, it prompted the Department of Education to propose a sale of direct loans in 2003. The loans had a higher market than budget value because the relatively high level of long-term rates caused the government to discount future guaranteed cash flows at a higher than market rate. The plan was to sell the loans, apply some of the proceeds to paying off Treasury debt, and to use the net gain to provide additional assistance to students. In fact, the sale would have entailed additional administrative costs without generating any real savings; the loans could not have been sold for more than a fair price. The OMB treats floating rates as short-term rates, so this problem is not reflected in the President's Budget.

on short-term interest rates and this convention will tend to bias down that component of cost in CBO estimates.

### 7.3.3 Budget Cost Decomposition

The Credit Supplement to the Budget, prepared by OMB, provides a breakdown of subsidy cost across four cost components—defaults, interest, fees and other—for four loan categories (Stafford Subsidized, Stafford Unsubsidized, PLUS, and Consolidated). Table 7.2 reproduces some of this data from the 2007 Credit Supplement. The total subsidy rate is the discounted value of projected net losses divided by the underlying loan principal at origination.

Both the direct and guarantee programs report small but similar subsidy cost components for defaults. The last two columns of table 7.2 break out cumulative lifetime default rates and recovery rates. Recovery rate estimates in excess of 100 percent are attributable to OMB's reporting convention rather than to exceptional performance: recovery amounts are not discounted and not all collection costs are deducted. After discounting and adjusting for collection costs, we estimate that the federal recovery rate averaged about 50 percent, in line with experience in the private student loan market. We also cannot reconcile the low reported default rates with our calculation of default rates from historical data from the Department of Education, which are described in section 7.5.

Default rates are for the most part similar in the two programs, reflecting similarities in the borrower populations. The exception is for consolidation loans, which experience much higher default rates in the direct program. As noted earlier, the higher default rate may be explained by the reluctance of guaranteed lenders to consolidate loans on the brink of default, and the fact that the direct program must consolidate the loans of qualified borrowers that wish to consolidate but have been turned down by guaranteed lenders.

For the remaining components of subsidy cost, the breakdown is markedly different across the direct and guaranteed programs. The biggest difference is that the direct program reports large interest income, whereas the guaranteed program reports large interest costs. This occurs in part because OMB defines the "interest" component of cost very differently across programs. In the direct program, the government reports net interest income as the present value of any interest paid by borrowers in excess of the Treasury rate, which it takes as the government's cost of capital. Because the borrower interest rate exceeds the Treasury rate, this item reduces the reported subsidy cost. In contrast, the interest component in the guaranteed program represents the present value of the net payments made to guaranteed lenders, which is an outflow. Although classified as interest, these payments are more accurately described as covering administrative and other costs, since borrowers' payments generally cover lenders' cost of funds. Hence

**Table 7.2 Composition of subsidy costs**

| | | Composition of subsidy | | | | | |
|---|---|---|---|---|---|---|---|
| | Subsidy rate | Defaults (net of recovery) | Interest | Fees | All other | Default rate | Recovery rate |
| Ford Direct Loan Program | | | | | | | |
| Weighted average of total obligations | 2.05 | 1.31 | –2.66 | –1.67 | 5.07 | 14.00 | 118.29 |
| Subsidized Stafford | 9.83 | 0.67 | 6.44 | –3.00 | 5.72 | 12.04 | 118.93 |
| Unsubsidized Stafford | –8.28 | 0.82 | –12.59 | –3.00 | 6.49 | 12.09 | 116.57 |
| PLUS | –6.37 | 0.89 | –11.97 | –4.00 | 8.71 | 5.50 | 101.51 |
| Consolidation | 4.37 | 1.92 | –0.99 | n.a. | 3.44 | 17.20 | 119.56 |
| Family Federal Education Loan Program | | | | | | | |
| Weighted average of total obligations | 9.87 | 0.89 | 11.12 | –5.54 | 3.40 | 12.04 | 117.65 |
| Subsidized Stafford | 17.78 | 0.86 | 17.62 | –3.25 | 2.55 | 12.04 | 118.99 |
| Unsubsidized Stafford | 1.12 | 0.96 | 0.79 | –3.25 | 2.62 | 11.15 | 116.27 |
| PLUS | –0.01 | 0.88 | –1.73 | –3.25 | 4.09 | 5.38 | 101.08 |
| Consolidated | 12.20 | 0.88 | 15.46 | –8.26 | 4.12 | 13.27 | 118.64 |

*Source:* Federal Credit Supplement 2006.

*Note:* n.a. = not applicable.

the reported "interest costs" cannot be meaningfully compared without adjustments.

Administrative costs in the direct program that are borne directly by the federal government are excluded from subsidy estimates, and do not appear in table 7.2. Costs that entail payments to third parties for tasks such as collecting on loans do appear, and are recorded in the category "other." In the guaranteed program, the corresponding costs are accounted for as part of "interest," as just discussed.

Fees levied on borrowers, guaranteed lenders, and guaranty agencies reduce subsidy costs. Only borrower fees affect the direct loan program, and they make a negative contribution to the subsidy rate. For the guaranteed program, these fees also include the upfront application fee on Stafford and PLUS loans in both programs, as well as the 1.05 percent per annum consolidation fee paid by guaranteed lenders to the federal government. Logically it makes more sense to think of lender fees as reducing the net administrative payments from the government to guaranteed lenders. To facilitate comparison, a more parallel treatment of administrative costs is presented in section 7.5.

## 7.4 Inferring Economic Costs and Cost Differentials

Estimating market cost requires a comprehensive measure of the cash flows associated with each program, and also a measure of the cost of capital. We impute the market risk premium on student loans from pricing in the private student loan market, and also use lender data to infer some components of administrative cost.

Private lenders primarily serve students who have exceeded federal lending limits.[11] The main players in the private loan market are also the largest guaranteed lenders—Sallie Mae and major national and regional commercial banks. Economies of scale in marketing, systems administration, and funding, and the experience gained from guaranteed lending, give these institutions a competitive advantage over other potential entrants. Although students can obtain private loans on their own, as with guaranteed lending, students often rely on the financial aid office for recommendations, which as for federal loans tends to limit direct competition between lenders for individual students.

The private loan market provides data that is useful in estimating inputs into the market value of government loans and loan guarantees. Some differences in the borrower populations and loan characteristics, however,

11. Limits are currently set at a cumulative amount of $23,000 for undergraduates and a $65,500 combined limit for undergraduate and graduate. There are also various annual limits on federal borrowing.

suggest some caution. We discuss these differences and their implications for imputed capital and administrative costs.

### 7.4.1 Cost of Capital

We consider two distinct aspects of the cost of capital. First we estimate the discount rate for cash flows associated with uninsured student loans, which is a critical input for the total cost calculations. We also estimate the differential between the cost to guaranteed lenders of funding guaranteed student loans in the capital markets, and the government's cost of raising funds through the Treasury. The latter is informative because it may be a source of higher real costs for guaranteed lending, and because it affects the minimum compensation required by guaranteed lenders.

*Finding the Risk-Adjusted Discount Rate*

The starting point for our analysis of the cost of capital for federal student loans is the typical interest rates charged by lenders on private student loans in 2006. Rates ranged from LIBOR + 2 to LIBOR + 7 percent (LIBOR stands for London Interbank Offered Rate). The rate offered varies by credit score and educational institution, but LIBOR + 4 percent was typical. Assuming a 30 bps spread between one-year LIBOR and one-year Treasury, the interest rate spread over one-year Treasury is on average about 4.3 percent.

What we mean by "the market cost of capital" is the discount rate that a fully private entity would use to value a claim on the net cash flows received by the government. The present value calculations can then be interpreted as what it would cost, on a per loan basis, to induce a competitive private entity to run each program. Since not all of the cash flows associated with the two programs have identical exposure to student loan risk, we adjust the risk premium to correspond to the risk of the various major components of cash flow, as described in more detail in section 7.5.3 and appendix B.

To derive the market cost of capital we adjust the rate charged to students for a variety of factors.[12] The 4.3 percent spread charged to students over Treasury rates has several components: it includes a risk premium that arises from the systematic risk in loan losses; administrative costs not covered by fees; expected losses from default; taxes; and a liquidity premium.[13] For our purposes, the market cost of capital is taken to include

12. Ideally, cost of capital estimates would be based on secondary market interest rates, which do not bundle financing costs with transaction costs. Unfortunately, data on whole loan secondary market transactions are not available.

13. The term "liquidity premium" is generally used to describe the component of credit spreads over Treasury rates not easily explained by other factors. The liquidity premium is thought to arise either from perceived risks that are not evident in historical data, or from the possibility that an absence of market participants could make it difficult to sell the security at fair value in the future.

the risk premium for systematic risk, the tax spread, and the liquidity premium. Default losses and administrative costs are excluded from the capital cost because they are explicitly accounted for in the derivation of expected cash flows.

The market cost of capital is identified by starting with the average 4.3 percent spread over Treasury, and subtracting estimates of administrative costs and expected default losses. As discussed below, administrative costs borne directly by guaranteed lenders, expressed as an annual cost rate, are on order of 97 bps. We add to this 15 bps to account for the higher costs of private over guaranteed loans. This leaves 3.18 percent for a risk premium, expected default losses, taxes, and a residual liquidity premium. We estimate the annual default loss rate from federal student loan data to be .75 percent per annum (see section 7.5), and assume it is slightly lower than default losses on private loans, which we take to be 1 percent. This leaves a 2.18 percent spread—the market cost of capital—that is attributable to the market risk premium, liquidity, and taxes. It is not possible to identify the size of the separate components, but we use this market premium in the base case cost analysis in the next section.

An alternative approach would be to approximate private lenders' cost of capital by looking at the weighted average cost of debt and equity capital for publicly-traded firms in this business. This turns out to be impractical for several reasons. First, there are few publicly-traded companies whose primary business is making and funding private student loans, as most of the big public lenders are divisions of major banks and do not report separately. The few public companies that specialize in private loans have been in business for a fairly short time, and given the volatility of returns, estimates based on a short history entail a high degree of uncertainty. Further, private lenders tend to manage risk through various contractual arrangements—for instance, through securitization structures and purchased credit guarantees—so their cost of capital does not accurately reflect whole-loan risk.

*Capital Cost for Guaranteed Loans*

The cost of capital for guaranteed lenders is lower than for private lenders because of the government guarantee. Nevertheless, their capital cost appears to exceed that of the Treasury. Here we consider the determinants of their borrowing costs.

Guaranteed lenders routinely obtain funding by securitizing parcels of previously originated federal loans and selling these asset-backed securities to investors, at a weighted average rate slightly over LIBOR.[14] This indicates

14. The LIBOR is a market interest rate frequently used on interbank loans between high-quality commercial banks. The default risk on LIBOR is thought to be small, but positive. Typically, LIBOR is 20 to 30 bps over the corresponding Treasury rate, but the spread varies over time.

that private investors do not view guaranteed loans as perfect substitutes for Treasury securities, despite the 97 to 99 percent federal credit guarantee.[15] In addition, lenders bear underwriting, Securities and Exchange Commission (SEC) filing, and other administrative fees that add to the total cost of capital for guaranteed loans. In comparison with the cost of Treasury funding for direct loans, it appears that even the largest guaranteed lenders typically pay 25 to 35 basis points more than the government to borrow.

There are a number of factors that may account for the premium over Treasury rates paid by guaranteed lenders. One is that a guaranteed loan is not truly risk-free—as well as the residual 1 to 3 percent retained default risk, lenders who fail to administer loans according to ED policy and regulations may have the guarantee voided for those loans. The exemption of Treasury interest from state and local taxes also lowers Treasury rates relative to LIBOR. Further, securitized student loans are less liquid than Treasury securities. The prepayment and extension options create uncertainty that increases investors' required return, as evidenced by higher spreads on the tranches of securitizations that absorb these risks.

Whether or not this higher funding cost is indicative of a real cost advantage of the government is debatable. Clearly, out-of-pocket funding costs are lower for the government, but the benefit may come at a commensurate cost to other stakeholders. For instance, the exemption from state and local taxes is a benefit to the federal government that is offset by the cost to local governments. The liquidity advantage may arise from the government's special legal status and ability to impose taxes, which lowers government expenditures at a hidden cost to taxpayers. We do not attempt to resolve the question of to what extent the cost advantage is real, but as a point of comparison we estimate what a 30 basis point per annum funding advantage is worth over the life of a loan.

### 7.4.2 Administrative Costs

Differences in administrative expenses on guaranteed loans and direct loans are an important driver of the economic cost differential between programs. Here we show that while many costs are similar in both programs, there are some additional costs associated with guaranteed lending that appear to make it fundamentally more expensive.

Administrative functions associated with all credit provision include origination, servicing, collection, and general overhead. Guaranteed lenders also consider the fees paid to the government to be administrative costs. From a programmatic perspective, however, lender fees affect the net cash flows from the government; they are not a program cost. The task of identifying administrative costs and allocating them across these activities is

15. This discussion is based on securitizations of floating rate loans, and prospectus data from Sallie Mae on recent issues.

complicated by limitations on data availability, but financial reports from ED and information from some guaranteed lenders provide the basis for our inferences.

Most lenders that originate private loans are also in the guaranteed loan business, and administrative costs appear similar for private and guaranteed loans (some minor caveats are discussed later). Financial statements from one such dual lender provides some data on administrative costs. The reports break noninterest expense into various categories. Some costs, such as servicing, apply to a portion of the outstanding loan portfolio in repayment, while other costs are incurred for origination activity, but do not apply to the outstanding portfolio. Although these financial reports do not allocate costs by activity, the reported numbers can be used to make some rough imputations.[16] We attribute 80 percent of personnel, consulting, and occupancy expenses to origination, 100 percent of promotional expenses to origination, and 50 percent of computer and other expenses to origination. Total origination expenses, divided by total volume of Stafford and private originations, is .95 percent. Representing this as an annual rate spread based on a ten-year amortizing loan implies an origination cost rate of 22 bps. The remaining noninterest expenses, divided by the portfolio of loans in repayment, yields an annual cost of 45 basis points. Thus, the dual lender directly bears an amortized cost of 67 basis points excluding collection costs, which we account for separately in default losses. Beyond this, the onetime origination fee paid to the government, debt issuance costs, spread over LIBOR on debt issued, and miscellaneous other expenses are estimated to add .3 percent to annual costs. Finally, we add an additional 10 bps for costs incurred by ED for administration of the guaranteed program, yielding a total administrative cost rate of 107 bps for guaranteed loans.

We want to emphasize that this estimate must be interpreted with caution. First, efficiency may vary considerably across lenders and there is likely to be considerable variation in administrative costs. Further, these costs reflect the current regulatory and organizational structure of the student loan market. Guaranteed lender origination costs include expenditures for the higher service levels and marketing expenses that arise from competition for borrowers and excess payments from the government that fund these practices. A different delivery system or lower federal payments to lenders would presumably reduce certain administrative expenditures.

The administrative costs for the direct program appear to be significantly lower than for guaranteed lenders, even taking into account costs that do not appear as part of the reported subsidy rate. An annual appropriation to the Department of Education covers the administrative costs of the direct pro-

16. Simply dividing total noninterest expense over the loan portfolio would be misleading because for a growing company not at a steady state, a disproportionate share of the total administrative cost is for current originations.

gram, although some of these costs are attributable to administering both the direct and guaranteed programs. This appropriation was approximately $800 million in 2006. At that time, the outstanding direct program portfolio was approximately $100 billion and the guaranteed portfolio approximately $300 billion.[17] In verbal disclosures, the Department reported allocating approximately $200 million of the appropriation to direct program servicing contracts, $30 million to direct program origination contracts, and $200 million to direct and guaranteed program recovery contracts (the latter is included in our estimate of default losses in the federal programs and subtracted here to avoid double-counting). We assume the remaining unallocated $370 million is attributable to servicing and origination functions of the direct and guaranteed programs in proportion to the size of each program. These amounts yield an estimate of amortized direct program origination and servicing cost of 32 basis points.

Taken together, these calculations suggest that the administrative costs of the direct program are about 75 bps per annum lower than on guaranteed loans. Again, this estimate must be interpreted with caution as it is based on incomplete data and simple approximations. Nevertheless, it suggests that real administrative cost savings could be achieved by restructuring or phasing out the guaranteed program.

### 7.4.3 Accounting for Government/Private Differences

Differences in borrower populations, loan terms, and administrative costs between government and private loans could bias inferences drawn from private market rates and administrative data. Those differences, and their likely effect on the estimates, are briefly discussed here.

*Borrower Defaults*

The federal programs serve a much broader population of students than do private lenders, suggesting that their risk profiles could differ. Since private loans appeal to students who have hit federal borrowing limits, they select for students at high-cost undergraduate institutions and professional students in medicine, law, and business.

Several factors suggest that federal borrowers are likely poorer average credit risks. Federal borrowers' eligibility does not depend on a credit score, whereas private lenders use credit scores to discriminate between borrowers, refusing credit entirely below some cutoff. Private lenders also can avoid originating loans at schools where graduates' employment prospects are weak. A partially offsetting factor is that private lenders extend credit to students who already have high federal loan balances and who start work with much higher levels of total indebtedness.

17. We assume the federal program is closer to a steady state, so dividing total costs by total loans is a reasonable approximation of annual costs.

Despite having quite different borrower populations, federal and the limited private statistics we have access to show quite similar losses from default (net of recoveries and collection costs). The composition of default losses, however, is quite different for the two types of borrowers. Default rates in the federal programs are approximately 1.8 percent of outstanding principal per annum, whereas they are only 1 percent per annum for private loans, supporting the idea that the private borrower population is less risky. The lower default rates in the private program, however, are offset by lower recovery rates. This is presumably because private lenders do not have access to federal collection remedies such as the Treasury offset program and administrative wage garnishment. To the extent that the lower private default rate implies lower market risk, the cost of capital inferred from that market is conservative when applied to riskier federal loans. As described in section 7.5, we estimate expected default rates on federal loans from extensive data on federal loans, so the cash flow estimates do not rely on private loan performance data.

*Loan Terms and Fees*

As well as bearing higher interest rates, private loan terms tend to be less favorable than on Stafford loans. Private loans cannot be consolidated at below-market rates, repayment options are more limited, and lenders may be less generous with forbearance. There are no grace or deferment periods, and unlike federal loans, death or disability does not trigger forgiveness. Private loans do offer loan maturities of up to twenty years, and the mechanisms to collect on defaulted loans are weaker than for the government. As on guaranteed loans (but not direct loans), lenders often offer incentives for on-time and electronic payments, and so forth. Among these nonrate differences, the consolidation option historically has been the biggest advantage of the federal programs. In Lucas and Moore (2007), we estimate that in every year from 2001 to 2005 the consolidation option has added more than 2 percent to the market value subsidy rate on new loans,[18] but with the switch to fixed rates, this will have less effect on relative value going forward.

Student fees appear to be somewhat higher on federal loans. Competitive pressures have reduced or eliminated origination fees on private loans, the result being that administrative costs are covered by higher rate spreads. Similarly, most guaranteed lenders pay the federal origination fee on behalf of borrowers. On direct loans, however, borrowers are still required to pay 1.5 percent up-front and the entire fee if they fail to make a timely first payment.

We make no quantitative adjustment for government/private differentials in loan terms or fees. To the extent that the more generous terms on gov-

18. With the switch to fixed rates, the consolidation option will have less value going forward, but the prepayment option will have more value.

ernment loans entail higher systematic risk (for instance, by increasing the duration of the average loan), estimates of the cost of capital based on private market rates are conservative.

*Administrative Costs*

Loan servicing is a competitive industry, and it is safe to assume that servicing costs are similar for government, guaranteed, and private lenders. Loan collection services can also be obtained at competitive prices, although guaranty agencies are paid a statutory amount that appears to exceed their cost of providing services, as discussed earlier. We assume similar collection costs for private and direct loans, and adjust for the subsidy component of payments to guarantee agencies in the guaranteed program. Some costs, however, are likely to be higher on private loans. Origination requires paying for credit scores (including those paid for students who ultimately borrow elsewhere or do not qualify). Private loans may also involve higher contracting costs (e.g., legal expenses) than do government loans. Finally, the purely administrative costs associated with loan financing are lower for the government. Securitizations of private and guaranteed loans involve fees to investment bankers and to rating agencies that presumably exceed Treasury's administrative costs. We assume that 15 bps of the private loan cost rate can be attributed to these additional costs.

## 7.5 Estimating Federal Program Costs

Estimating a comprehensive measure of cost involves projecting the distribution of future cash flows to and from the government over the life of a loan or guarantee obligation, and discounting at risk-adjusted rates. We start by modeling the cash flows associated with the underlying loans, taking into account program rules,[19] borrower behavior, and the various options affecting payment patterns. These cash flows, in combination with rules for payments between guaranteed lenders and the government, also determine the cash flows associated with guaranteed loans.

A subsample of student records from the Department of Education's National Student Loan Database System (NSLDS), described in appendix A, provides information on historical borrower payment patterns, which is used to parameterize the model. In particular, we derive new estimates of default and recovery, which are critical inputs. We use a sample from the database drawn in January 2006, which contained historical information on loans and borrowers dating back to 1980, although we used the older data only where absolutely necessary. The sample comprises over ten million loan records and one million borrowers.

19. Estimates are based on rules in effect for the 2006 to 2007 program year. Recent legislative changes alter these parameters for loans originated in 2008 and thereafter.

We then use Monte Carlo simulation to project future cash flows that depend on a model of stochastic interest rates and borrower behavior. Discounting projected net cash flows at the risk-adjusted rates (derived as previously described and in appendix B) yields cost estimates for both programs. A rougher but simpler estimate based on the difference between private and government student loan rates is shown to produce comparable results.

### 7.5.1 Cash Flows

On direct loans, there is an initial outflow of principal when the borrower takes a new loan, less fees paid by the borrower. Subsequently, net inflows of repaid principal and interest flow to the government over time, including amounts recovered from default less any recovery costs. The government also incurs ongoing administrative costs, which we apportion to individual loans on a per annum basis.

In the guaranteed program, government cash flows include net transfers to and from guaranteed lenders (some through guaranty agencies) on each outstanding loan, equal to the difference between the borrower's interest payment and the three-month commercial paper rate plus a spread. This is referred to as a Special Allowance Payment, or SAP. The spread is equal to 1.74 percent per annum for Stafford loans when the borrower is in school, 2.34 percent for Stafford loans when the borrower is in repayment, and 2.64 percent (less the 1.05 percent per annum lender consolidation fee) for consolidation loans. The government also makes guarantee payments to lenders for claims on defaulted loans, and pays "retention" fees to guaranty agencies in proportion to their recoveries on defaulted loans.

In both programs, the task of estimating cash flows is complicated by the many options available to students to defer and extend loan payments or to prepay, and also by default behavior. We now turn to the calibration of these behavioral assumptions, which is based on program rules and observed behavior in the NSLDS.

*Effective Maturity and Repayment Status*

Time to repayment varies widely, from less than a year to over thirty years. Borrowers may prepay their federal loans without penalty, and some borrowers repay rapidly. For example, approximately 8 percent of originated loans close in less than five years, and approximately 60 percent within fifteen years (see figure 7.2).[20]

There are also various options that extend the repayment period. Borrowers with high balances have standard options to extend Stafford loans beyond the basic ten-year maturity.[21] The right to consolidate Stafford loans

20. These estimates treat loan consolidations as an extension of the original loan rather than a new loan. Stafford loan lifetimes would otherwise appear to be much shorter than this.

21. Stafford borrowers with a balance of $30,000 or more from a single lender (whether a single guaranteed lender, or a loan from the direct program) may choose an extended repay-

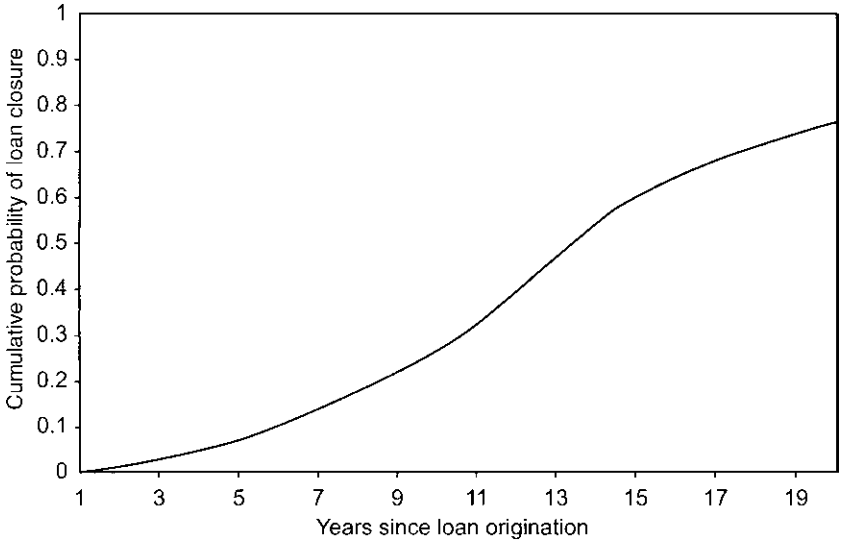


**Fig. 7.2 Distribution of loan lifetimes**
*Source:* Estimates from 2006 sample of the National Student Loan Database.

allows borrowers to extend the term of their original loans, as well as to convert floating rate loans to a fixed rate.[22] For some borrowers, consolidation allows them to extend for up to thirty years. Eligibility for term extension depends on the size of the consolidated loan, as shown in table 7.3.

While in school and for a few months after graduating, borrowers do not need to begin repayment. During this grace period, the federal government pays the interest for subsidized loans, whereas interest accrues on unsubsidized loans. Periods of grace necessarily raise the market-based subsidy cost even for unsubsidized loans, since the interest rate that accrues is typically lower than the market cost of capital. Over 95 percent of loans by originated value are in an in-school or grace period in the year of origination, but less than 10 percent of loans are in a grace period four years after origination. The average time in school is approximately 2.5 years (excluding time in loan deferral for subsequent schooling, discussed next).

Borrowers are also entitled to lengthy payment deferral in times of financial hardship or, for Stafford borrowers, to pursue further studies. Stafford

ment plan of up to twenty-five years. Income contingent and graduated repayment plans are also available.

22. The OMB treats consolidation loans as new loans rather than the extension of existing loans. This leads to a higher reported loan volume, but a lower subsidy cost per Stafford loan than reported in this chapter, as we treat consolidation as an extension of existing loans. This treatment makes it easier to interpret default and recovery experience, and also ensures that the subsidy cost includes the value of the option to consolidate.

**Table 7.3** **Allowable term by balance**

| Term | Balance must be at least (in US $) |
|---|---|
| 10 years | — |
| 12 | 7,500 |
| 15 | 10,000 |
| 20 | 20,000 |
| 25 | 40,000 |
| 30 | 60,000 |

*Notes:* Allowable term for extended and graduated repayment plans in the direct program and for newly consolidated loans in both programs. Balance refers to total balance of loans in the direct program for direct program extensions and total balance of loans consolidated for consolidation term extension. In the guaranteed program, borrowers with balances of more than $30,000 can elect a twenty-five-year extended repayment term on their original loans.

loans are also forgiven in the event of death or disability of the borrower. An effect of these provisions is that they may lower reported default rates. Periods of in-school deferment last as long as the borrower remains in school, whereas borrowers experiencing financial hardship may elect a three-year payment deferment or payment forbearance period (the former is available only under more restrictive conditions). Analysis of loans in the NSLDS suggests that borrowers enter deferment or forbearance at a rate of approximately 6 percent per annum for a typical term of three years.

The distribution of loan maturities and repayment behavior used to calibrate the model are based on NSLDS data. The effect of these repayment options is shown in figure 7.3, which breaks down outstanding loan principal by loan status in January 2006 for both the direct and guaranteed program. Overall, only about half of the loans are in repayment, while grace, deferral, forbearance, and default account for the remainder.

The future distribution of loan lifetimes may be more drawn out than indicated by historical data, since the closure rates at long horizons are based on loans taken out when the federal loan program offered less favorable terms to borrowers than currently or in the recent past. Nevertheless, the stochastic repayment behavior in the model is based on historical experience.

*Default and Recovery*

Borrower default is an ongoing concern in both the direct and guaranteed lending programs, despite the strong loan enforcement mechanisms that the government has at its disposal.[23] Before direct lending, the guaranteed lending program reported very high default rates. In response, Congress made a number of changes to the Higher Education Act. Chief among them was the use of cohort default rates as a performance measure and as a criterion

23. Student loans, both federal and private, are not dismissed in bankruptcy. The government can collect on defaulted loans through the Treasury Offset Program.

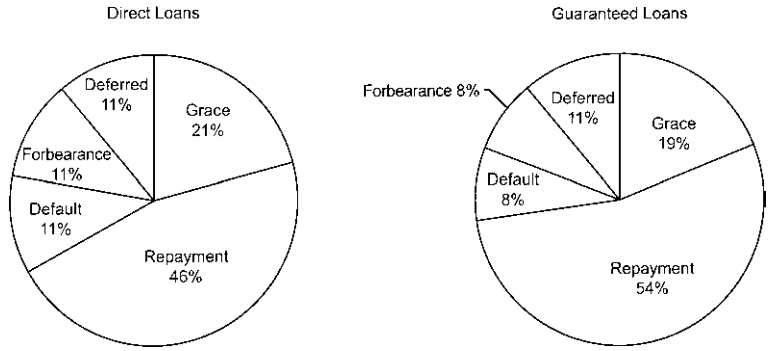


**Fig. 7.3 Status of direct and guaranteed loan portfolio, January 2006**

for schools to retain access to federal student loans and grant funding. Since the adoption of these measures, new default claims in both the direct and guaranteed lending programs have more than halved.

The strength of the US economy contributed to generally falling default rates over the period 1990 to 2005. The increased use of deferment, forbearance, and consolidation may also have contributed to lower default rates, although offering more generous terms to students is costly when it delays an inevitable default or makes recovery more difficult. Table 7.4 reports default claims as a percent of outstanding balances for 1990, 1996, and 2005.

Figure 7.4 shows the average default rate of loans issued between 1996 and 2006 by years since entering repayment for guaranteed Stafford, guaranteed consolidation, direct Stafford, and direct consolidation loans. Average default rates are around 1.8 percent per annum. Stafford loans experience higher levels shortly after entering repayment, which may in part reflect the cumulative effect of in-school grace periods (since a borrower cannot default while he or she remains in school even though adverse circumstances may arise that impair a borrower's current and future ability to repay their loans). Consolidated direct loans report higher default rates than consolidated Stafford loans because the Education Department frequently consolidates borrowers close to default. Data confirms that borrowers that consolidate defaulted loans are more likely to default on their consolidation loans than other borrowers. We attribute the cost of default to the program in which the loans were first originated rather than the program that consolidated them.

The OMB reports recovery rates on student loans that far exceed those on other forms of unsecured consumer credit, but as discussed in section 7.3.3, their measure neglects collection costs and time value. Relying instead on NSLDS data, we find that individual loans exhibit significant variability in recoveries, with some defaulted loans resolved quickly and others remaining uncollected for more than ten years. The typical pattern suggests that

**Table 7.4** **Default claims as a percentage of the outstanding federal loan portfolio**

| Budget year | 1990 | 1996 | 2005 |
|---|---|---|---|
| Outstanding loan portfolio ($million) | 49,890 | 57,557 | 242,581 |
| Default claims ($million) | 2,384 | 1,428 | 3,818 |
| Percentage of loans in default | 4.8 | 2.5 | 1.6 |

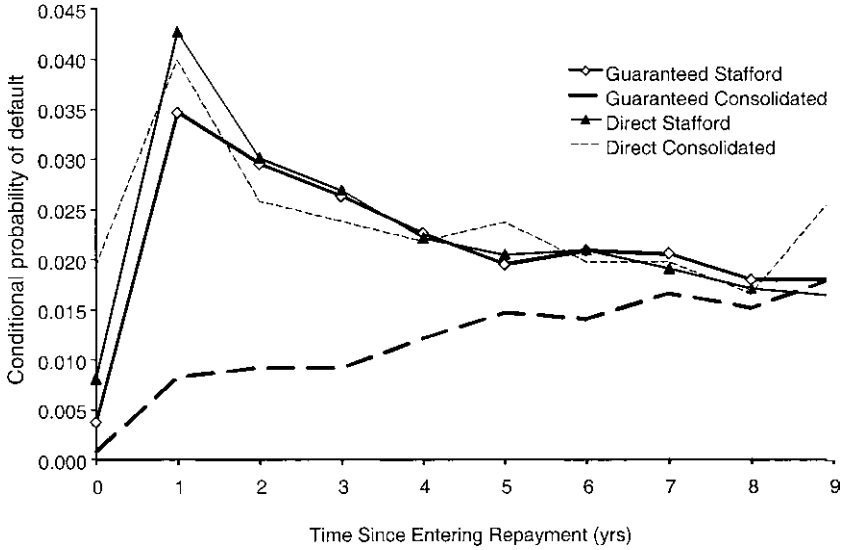


**Fig. 7.4** **Default rates (weighted by loan value) by years since entering repayment**

collection rates diminish over time. Applying a risk-adjusted discount rate (equal to the average interest rate over the data period plus our assumed 2.18 percent risk premium) and subtracting a program-specific recovery cost suggests a recovery rate of around 60 percent of the defaulted principal on direct loans and a slightly lower rate on guaranteed loans because of higher recovery costs.[24] Combining this with the annual default rate of 1.8 percent per annum implies losses from default equal to .75 percent of principal outstanding per annum, which is the basis for our estimates.

### 7.5.2 Risk-Adjusting Discount Rates

A major goal of this analysis is to understand the effect of market risk on estimated program costs. As described in section 7.4.1, an analysis of the

24. The ED indicates collection costs on direct loans of about 16 percent. Statutory collection costs are higher on guaranteed loans, as guaranty agencies retain 23 percent of recoveries on Stafford loans, 18.5 percent for loan rehabilitation, and 10 percent on loans cured by consolidation.

private student loan market suggests an estimate of the credit risk premium for student loans is 2.18 percent. The 2.18 percent premium is used in the base case estimates, but the sensitivity analysis reports results for lower and higher risk premiums.

The cost of capital is also affected by the term premium: the difference between long-term and short-term Treasury rates. The valuation model incorporates the term premium in the interest rate model, but for simplicity and because there does not appear to be a strong empirical correlation between them, we treat the risk that generates the term premium as independent from the risk driving credit spreads.

To the extent that program cash flows are proportional to loan cash flows, one can simply apply the risk-adjusted discount rate for student loans to other program cash flows. The risk-adjusted discount rate is a maturity-matched interest rate from the interest rate model plus a credit risk premium. Applying this discount rate to all cash flows is a reasonable approximation for the direct program, assuming that administrative costs are proportional to loan cash flows.

Correctly discounting risky cash flows in the guaranteed program is more complicated because the various components of guaranteed cash flows have different exposures to market risk. With a 100 percent credit guarantee, the federal government's cash flows are equivalent to directly lending to the student but financing the loan by borrowing from the private sector instead of from the Treasury, and contracting with guaranteed lenders for origination, servicing, and part of collection (we call these equivalent credit arrangements *implied loans*).[25] The cash flows from the implied student loan have interest rate risk, since they are made at a fixed rate that is unrelated to market interest rates. They also have credit risk. Implied student loan cash flows are discounted at the same rate as cash flows in the direct program. In contrast the implied loan made by guaranteed lenders to the federal government is largely unaffected by default risk. Specifically, the guaranteed lender is assured of receiving full repayment of principal and interest (at a floating rate), so there is a component of cash flow that is virtually free of default and interest rate risk. At the same time, there is the risk that default, prepayment, or consolidation will terminate or reduce the stream of lender payments (i.e., the SAP), which introduces an element of market risk to the administrative cost reimbursements.

To incorporate the effect of these risks on the value of direct and guaranteed loans, we graft a simple two-state model of default onto a stochastic interest rate model to provide state-dependent discount rates (or

25. This implicitly treats borrower incentives offered by lenders, retention allowances to guaranty agencies, and the various onetime fees between lenders and the government as part of the contractual services purchased by the government.

state prices). Each state of the model corresponds to an interest rate and a borrower default state (i.e., whether default has occurred or not), allowing us to specify cash flows in each of those states and discount them accordingly. The appropriate discount rates differential between default and nondefault states is inferred from the spread between risky and risk-free loans (and justified by a no-arbitrage argument). Appendix B explains the interest rate and risk-adjustment models in detail.

### 7.5.3 Simulations

Subsidy value is estimated using Monte Carlo simulation. Each month a random draw from a normal distribution determines the innovation in the short-term interest rate, and the corresponding term structure of interest rates is derived from the Cox Ingersoll Ross (CIR) model (see Lucas and Moore [2007] for a complete description of the interest rate model and the parameters used in estimation, and also Jagannathan, Kaplin, and Sun [2003]). Variation in interest rates affects the discount rate and guaranteed lender payments.

Monthly loan repayment cash flows depend on various borrower behaviors: whether the borrower is in school; the borrower's repayment plan; consolidation; default, recovery, prepayment; and an administrative charge. Appendix B contains a description of how we simulate the cash flows that depend on stochastic borrower behavior. It also describes the aggregation of cash flows across representative loan groupings.

*Base Case Assumptions*

The cash flow model is calibrated under the following base case assumptions:

*Borrower interest rates:* From June 2006 onwards, borrowers will pay a fixed rate of 6.8 percent per annum on all new Stafford loans. When those loans are subsequently consolidated, the interest charged on that portion of the consolidation loan that comes from post-2006 Stafford loans will be at a 6.8 percent rate (plus up to 0.075 percent after rounding).

*Repayment horizons:* A typical loan repays over a twenty-year term, but any individual loan can be repaid over shorter or longer horizons. The probability of slower repayment is positively correlated with the borrower's balance. For borrowers entering repayment, approximately one-third of all loan value is in each of three balance categories, and, respectively 15, 40, and 60 percent of borrowers in each category take up the maximum term extension option.

*Default losses:* The value of default losses each year is equal to .75 percent of outstanding balances in the direct program and .82 percent in the guaranteed program. The guaranteed program losses are assumed to be

higher because the federal government pays more to guaranty agencies for their collections from defaulted borrowers than they do to private contactors in the direct program.

*Noncollection-related federal administrative expenses:* The federal government incurs direct administrative expenses for both programs. These costs are not included in official budget subsidy estimates, but they are included in the more comprehensive estimates here. Each year, we assume the department directly spends 0.32 percent of outstanding principal administering the direct program (excluding collections costs accounted for in default losses) and 0.1 percent administering the guaranteed program. The administrative costs borne by guaranteed lenders in the guaranteed program do not directly affect subsidy rates.

*Guaranteed lender payments:* The federal government pays guaranteed lenders a spread above the quarterly reset three-month commercial paper rate, which is simulated using the CIR model. The spread paid to lenders varies with the type of loan and its payment status as described earlier, and terminates upon default.

*Loan origination and guarantee fee receipts:* The government charges borrowers 3 percent in origination and guarantee fees in both programs. In the direct program, this reduces the subsidy cost by about 2.2 percent, since .8 percent is returned to students as a borrower benefit.[26] In the guaranteed program, 1 percent of this is transferred to guaranty agencies. Finally, guaranteed lenders pay a 0.50 percent fee, but guaranty agencies receive four-fifths of it.

*Adjustments for Federal revenue effects:* The companies that serve the direct and guaranteed programs pay federal corporate income taxes. To the extent that incremental taxable income is generated because of the federal student loan program, the corporate income taxes paid should be taken into account in calculating the net federal outlay. However, current budget practice does not recognize income tax receipts in subsidy estimates, implicitly assuming no net change in private economic activity arises from federal actions. A recent study by Price Waterhouse Coopers (PWC 2005) estimated that the guaranteed lending program generates corporate income tax with a present value of 1.5 cents per dollar of loans originated, which translates to an approximate per annum tax receipt of 20 basis points per dollar outstanding. The direct program also generates corporate income taxes from information technology (IT), servicing, and collections contracts with private companies, but PWC did not estimate those revenues. We assume this generates no more than 5 basis points of

26. The ED has the option to reduce the cost to 1.5 percent for borrowers who enter repayment on time. The ED estimates that approximately 50 percent of borrowers receive this benefit.

tax revenue, leaving a 15 basis point per annum tax differential between the direct and guaranteed programs. To what extent a tax offset should be reflected in budget estimates remains a controversial issue. In our base case subsidy estimates and consistent current budget practice, we ignore the differential tax effect, but we do account for it in the sensitivity analysis.

### 7.5.4 Subsidy Estimates

Table 7.5 presents subsidy estimates for newly originated loans in academic year 2006 (July 1, 2006 to June 30, 2007) under the base case assumptions outlined previously. The overall subsidy rate for each program is computed by averaging over representative groupings of loans by subsidized status and outstanding balance. Two striking findings emerge. First, the market subsidy rates are considerably higher than those reported in the budget—20.1 percent for the direct program and 31.3 percent for the guaranteed program. Second, the market cost differential between the direct and guaranteed program is similar to the budget estimate, even after adjusting for omitted administrative costs in the direct program.

To understand these findings, it is instructive to break down the costs of each program into their major component parts. As shown in table 7.6, the difference between the loan amount and the present value of student loan repayments accounts for the biggest cost for both programs at approximately 20 percent of the loan amount. The higher federal servicing and origination expenses under the direct program are more than offset by the value of federal payments to guaranteed lenders, and this difference accounts for most of the overall difference in subsidy rates between the two programs.

Within each program, subsidy rates vary with whether loans are "subsidized," and with the availability of longer loan terms (table 7.5). Costs are

**Table 7.5** **Base case market-based subsidy estimates for new Stafford loans originated in award year 2006**

| | Direct | Guaranteed | Difference |
|---|---|---|---|
| Unsubsidized loans | | | |
| Up to 10-year term | 11.7 | 22.0 | 10.3 |
| Up to 20-year term | 13.5 | 25.3 | 11.8 |
| Up to 30-year term | 14.7 | 27.1 | 12.4 |
| Weighted average subsidy of unsubsidized loans | 17.5 | 27.6 | 10.1 |
| Subsidized loans | | | |
| Up to 10-year term | 25.4 | 34.3 | 8.9 |
| Up to 20-year term | 27.0 | 37.0 | 10.1 |
| Up to 30-year term | 28.6 | 39.2 | 10.6 |
| Weighted average subsidy of subsidized loans | 30.4 | 39.0 | 8.6 |
| Program average | 20.1 | 31.3 | 11.2 |

**Table 7.6 Components of subsidy rate**

| | Direct | Guaranteed |
|---|---|---|
| Loan disbursement | 100.0 | 100.0 |
| Present value of loan repayment (after collection) | –79.8 | –79.8 |
| Borrower origination fees | –3.0 | –3.0 |
| Net present value of representative loan | 17.1 | 17.1 |
| plus | | |
| Federal servicing and origination expenses | 2.1 | 0.8 |
| Direct program origination fee reduction | 0.8 | n.a. |
| Lender origination fees | n.a. | –0.7 |
| Lender share of guaranteed loan losses | n.a. | –0.2 |
| Lender special allowance payments | n.a. | 13.2 |
| Guaranty agency origination and excess collection fees | n.a. | 1.1 |
| Subsidy rate | 20.1 | 31.3 |

higher for subsidized than for unsubsidized loans by the present value of in-grace and in-deferment interest paid by borrowers with unsubsidized loans that is not paid by borrowers with subsidized loans. A typical subsidized borrower spends around three years in grace and deferment, and avoids paying the 6.8 percent interest rate during these periods. This increases the subsidy to the student by about 12 percent of the loan amount.

Subsidy rates increase with loan maturity. Allowing borrowers to extend a ten-year Stafford year loan to twenty years raises the subsidy rate by about 3 percent. This takes into account that many borrowers fail to take advantage of term extension options and frequently pay their loans off early, so potentially the extension cost could be even higher if borrower behavior changes.

### 7.5.5 Sensitivity Analysis

*Borrower Behavior and Economic Conditions*

Aggregate subsidy estimates under alternative assumptions about model parameters are shown in table 7.7. Subsidy estimates are quite sensitive to the assumed risk premium. Assuming a 1 percent higher (lower) risk premium than in the base case raises (lowers) subsidy rates by 7 percent. For the direct program, this is most easily understood as a higher discount rate, reducing the value of future repayments. On the guaranteed loans, the effect of market risk is to raise the present value of guarantee payments made on defaulted loans. By contrast, the credit risk premium has a small effect on the present value of net income payments to guaranteed lenders. The effective duration of the loans also affects value, with loan extension generally increasing cost. This can be attributed to the below-market interest rate charged to borrowers. Table 7.6 reports subsidy costs with 25 percent faster and slower loan repayment rates, which serve to lengthen or shorten the average loan term by approximately four years. The increase (decrease) raises (lowers)

**Table 7.7 Parameter sensitivity of subsidy rates**

| | Direct | Guaranteed | Difference |
|---|---|---|---|
| Base case subsidy rate | 20.1 | 31.3 | 11.2 |
| Varying credit risk and credit risk premium | | | |
| High credit risk premium (3.58% p.a.) | 26.2 | 36.2 | 10.0 |
| Low credit risk premium (1.58% p.a.) | 12.6 | 25.3 | 12.7 |
| No credit risk premium | 1.1 | 16.5 | 15.4 |
| Speed of repayment | | | |
| 25% faster than base case | 17.3 | 27.1 | 9.8 |
| 25% slower than base case | 22.3 | 34.6 | 12.3 |
| Not sensitive to interest rates | 19.8 | 31.0 | 11.2 |
| Other | | | |
| No treasury financing advantage in direct program | 21.9 | 31.3 | 9.4 |
| Longer Stafford repayments/reduced consolidation | 20.3 | 31.5 | 11.2 |

*Note:* p.a. = per annum.

subsidy costs by about 2 percent. The final experiment assumes that with the less favorable conditions for consolidation going forward, more loans will be extended in the Stafford program rather than being consolidated. This scenario raises the subsidy rate in the guaranteed program because of the higher lender payments on Stafford loans.

Looking to the future, subsidy rates for new loans may be considerably different from the estimates for 2006 reported in table 7.5. The most obvious cause of future variation in new loan subsidy rates is changes in interest rate conditions. This is because borrower interest rates are fixed at 6.8 percent per annum for all new Stafford loans, whereas the government's opportunity cost moves with prevailing interest rates. Figures 7.5 and 7.6 show simulated average, tenth, and ninetieth percentiles of the subsidy estimates for, respectively, the direct and guaranteed programs over each of the next ten years. To make these forecasts, we use the interest rate model combined with current yield curve information to provide simulated paths of future interest rates to determine starting conditions for each year. We assume loan cash flow performance is consistent with the assumptions of the base case (but appropriate to interest rate conditions). As the horizon lengthens, the course of future interest rates becomes more uncertain so the band of subsidy values widens in both programs.

Finally, we consider a set of parameters that are more favorable to guaranteed lending. We credit the guaranteed program with 15 bps per annum for tax revenues, and allocate a higher portion of administrative costs incurred by the Department of Education to direct lending.[27]

27. In this scenario, 90 percent of the $360 billion in unallocated costs is assumed to be for the direct loan program, whereas in the base case it is allocated proportionally to loan volume. This reduces the administrative cost advantage in the direct program from 75 basis points to 45 basis points.

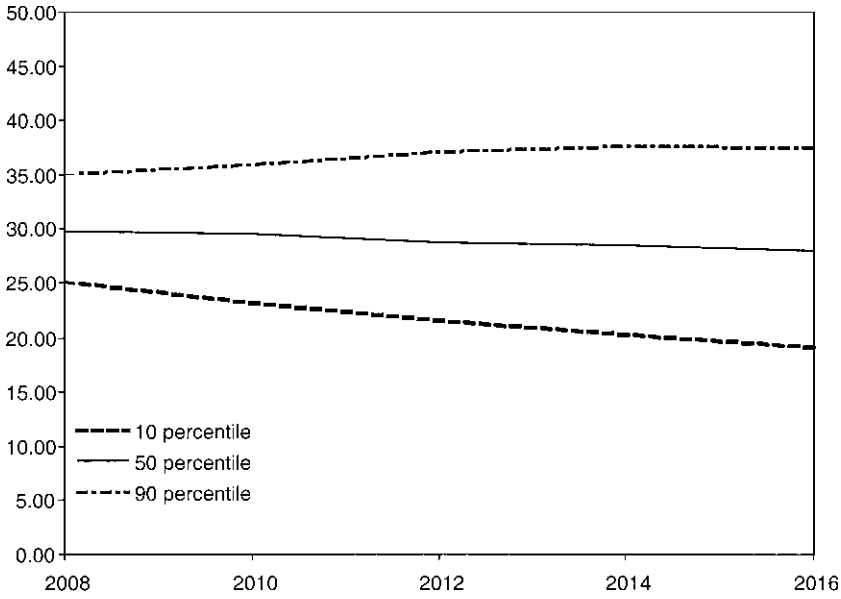


**Fig. 7.5 Distribution of future subsidy rates given interest rate uncertainty in the direct lending program**

All other assumptions are as in the base case. The result is a narrowing of the subsidy rate difference of the two programs from 11.2 percent to 8.0 percent.

*Policy Alternatives*

The model is also useful for examining the effect of various policy alternatives on subsidy costs. One option is to lower the guaranteed lender payments to bring the guaranteed subsidy closer to the direct loan subsidy rate, and to reduce the excess of payments over basic administrative costs. The first two rows of table 7.8 report the predicted subsidy estimates after lowering lenders' payments by 0.5 percent and 1.0 percent per annum, respectively. The effect of the 1.0 percent reduction is to bring the subsidy in the guaranteed program to within 5 percent of the direct program. The calculations in the next section suggest, however, that a reduction of this magnitude might make guaranteed lending unprofitable for many lenders. The 0.5 percent reduction still leaves a cost differential of 9.1 percent between the programs. The cuts in lender payments enacted in 2007 are at the lower end of this range, suggesting a lower but still significant cost differential for loans originated after September 2007.

Another set of alternatives relate to whether the interest rate paid by borrowers is fixed or floating. Switching from variable to fixed interest rates on Stafford loans has increased the subsidy cost for 2006 by approximately

**Table 7.8 Subsidy rates under alternative policies**

| | Direct | Guaranteed | Difference |
|---|---|---|---|
| Base case | 20.1 | 31.3 | 11.2 |
| Cut annual lender payments by 0.5% | 20.8 | 28.0 | 7.7 |
| Cut annual lender payments by 1.0% | 20.9 | 25.2 | 4.8 |
| Floating rates as under 1998–2006 law | 19.4 | 30.6 | 11.2 |
| Floating rates but without floor on Lender's Special Allowance | 19.4 | 30.0 | 10.6 |
| 3.4% rate on loans—without behavioral response | 37.4 | 47.2 | 9.8 |
| 3.4% rate on loans—with behavioral response | 40.5 | 50.3 | 9.8 |
| 90% federal guarantee | 20.1 | 28.7 | 8.6 |
| 75% federal guarantee | 20.1 | 25.4 | 5.3 |

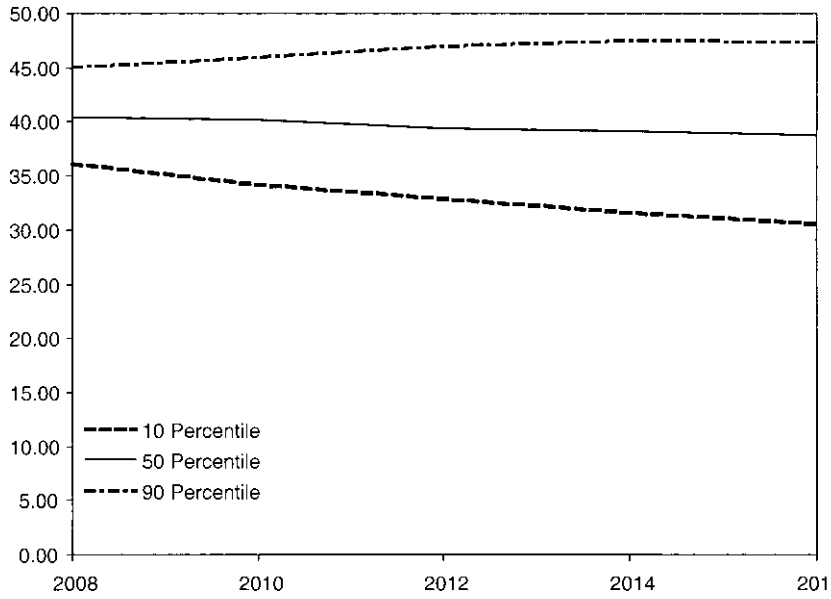


**Fig. 7.6 Distribution of future subsidy rates given interest rate uncertainty in the guaranteed lending program**

2 percent, in part because the opportunity cost of a fixed rate loan is higher than for variable rate loans (because the term premium is positive), and in part because our long-term interest rate projection implies the variable rate will average more than 6.8 percent. The switch to fixed rates also exposes the government to interest rate risk. If market interest rates continue to increase, subsidy costs on loans originated after 2006 could be significantly higher than they would be under the variable rate policy.

Changing the level of rates charged to students also obviously affects cost.

Recent legislation will gradually reduce the rate on loans to undergraduate students until it is 3.4 percent in 2011. All else equal, this increases the subsidy rate by approximately 16 percentage points. In fact, the subsidy cost likely will increase by more than this since the lower rate provides incentive for borrowers to reduce prepayment rates, and to switch to longer term repayment plans.[28]

### 7.6 Decomposition of Guaranteed Lender Costs

The analysis thus far has focused on government costs. Here we look at costs from the perspective of a guaranteed lender. This decomposition is useful in considering how much government payments to lenders could be reduced without causing many lenders to exit the market, and also for quantifying the extent to which guaranteed lending is fundamentally more expensive.

Our decomposition of guaranteed lender costs relies on section 7.4 calculations of administrative and capital costs. As mentioned earlier, these estimates are based on limited data and the costs of individual lenders may vary considerably. Recall that lenders are guaranteed of receiving the three-month commercial paper rate plus a spread that averages about 2.28 percent on Stafford loans, and 1.59 percent on Consolidation loans. Estimated lender origination, servicing, and other expenses are .97 percent. Subtracting this from the guaranteed payment rate leaves a margin of 1.31 percent (2.28 – .97) on Stafford loans and .62 on Consolidation loans (1.59 – .97). The 2007 legislative cuts to lender payments absorb less than half of this margin on Stafford loans, but almost all of it on Consolidation loans. These calculations may explain the subsequent exit of many lenders from the consolidation business in recent years, and that some borrower benefits have been reduced or eliminated.

The amount by which guaranteed lending as it is currently structured is fundamentally more expensive than direct lending can be estimated by comparing the administrative expenses and funding costs of the programs. Our estimates suggest that on the high end, this disadvantage is 105 bps per annum—based on a 75 basis point administrative cost disadvantage relative to the direct program, and a 30 bp funding disadvantage relative to Treasury. Capitalizing the resulting annual cost differential of 105 basis points over the life of a typical loan yields a present value cost advantage equal to 5.34 percent of loan principal.

28. The availability of such low cost credit could lead to abnormally high lending volumes, which would increase the total dollar subsidy. Moreover, the subsidy will increase on a per loan basis if borrowers choose to prepay their loans less frequently. We estimated the latter effect using the historic response of borrower prepayment to the level of interest rates for fixed rate consolidation loans and found that accounting for reduced prepayment in high interest rate environments increases the subsidy by approximately 3 percent.

## 7.7 Conclusions

In this chapter we have developed a model that provides comprehensive estimates of the federal cost of providing student loans, which takes into account the effect of borrower behavior, economic conditions, and program rules. We find that the cost of both the direct and guaranteed student loan programs is significantly understated in the federal budget, primarily because the budget neglects the full cost of capital, but also because of the way administrative costs are accounted for. This is important because it suggests that the relatively rapid growth of federal funding for student loans relative to outright grants may have been influenced by misleading estimates of loan cost.

Our second major finding is that even after adjusting for the cost of capital and administrative costs that are omitted in the budget, the direct program is considerably less costly to the government than is the guaranteed program. It appears that the higher cost of the guaranteed program arises primarily from the statutory payments to guaranteed lenders that exceed their cost of offering loans. Even if payments to lenders were cut to the minimum required to induce participation, the guaranteed program appears to be fundamentally more expensive due to a market structure that entails higher administrative and capital costs.

Despite its higher cost and recent concerns about certain lending practices, the guaranteed program has survived periodic attempts to supplant it with direct lending. History shows that the political fortunes of the two programs have shifted over time, but that cost has yet to be a decisive factor.[29] The 2007 legislation that cuts payments to guaranteed lenders and creates new advantages for the direct program will reduce future cost differences, and will likely increase direct lending volume at the expense of guaranteed lenders. However, the changes were for the most part incremental: they do not address the factors that make guaranteed lending fundamentally more expensive, and lenders still receive fixed compensation rather than a competitively determined payment.[30] The question of how these costs could be more effectively controlled is an important one that we leave for future analyses.

The financial crisis that began in late 2008 placed unprecedented stresses on the guaranteed student loan program. Despite the government guarantee, the securitization market for student loans collapsed and rate spreads ballooned. To ensure continuity in funding for students, the Department of Education stepped in and purchased new originations from guaranteed lenders financed by Treasury. It has also prompted stronger calls for scaling back the role of guaranteed lending.

29. The New America Foundation (2009) provides a lively description of the history of the competing programs.

30. A provision that introduces an auction for some PLUS loans does take a step toward creating such a mechanism.

## Appendix A

## *Description of NSLDS Data*

The Department of Education administers the National Student Loan Database System (NSLDS), a record-keeping system that tracks the status of individual loans and borrowers. The Congressional Budget Office receives an annual subsample of loan and borrower records each January, which it uses to make cost estimates. The database comprises multiple linked files containing current and historical information about borrowers and their loans. The files used to produce market-based subsidy estimates in this chapter are as follows.

*Loan file:* The file comprises one record per loan on the type of loan (direct or guaranteed, consolidated or original), the date the loan was taken, the amount disbursed, the principal outstanding at the time the sample was drawn, the current status of the loan, and the academic level of the student when the loan was taken. Each loan record also contains a unique identifier for the borrower, school, and guaranty agency associated with the loan, making aggregation of loans by borrower possible. The file contains 5.42m loan records for 1.30m distinct borrowers, spanning the period from 1985 to 2006.

*Loan status history file:* The file contains a sequence of records with dates and codes for each loan's status changes. A status change occurs for various reasons including: entering repayment, default, deferment, forbearance, consolidation, and payment in full. The historical timing of status changes provides a basis for estimating the probability that new loans transition through the various statuses over their lifetime. The file contains 25.60 million records for 5.42 million distinct loans.

*IRS and guaranty agency collections files:* These files track the timing and amount collected by the IRS, guaranty agencies, the Department of Education, and their contracted agents from borrowers with guaranteed loans in default. No recovery information is available on direct program loans in default. The files contain the amount collected and date of collection for each defaulted loan. The amounts recovered by issuing the borrower with a consolidation loan are not recorded as a dollar amount so the value must be imputed. Collection amounts are combined with historical loan status changes of defaulted loans in the loan status history file to compute a recovery rate on defaulted guaranteed loans, which we assume is very similar to that in the direct program. The IRS offset file contains 340,000 loans on 156,000 loans. The combined guaranty agency and departmental collection file contains 4.05 million records on 355,000 distinct borrowers.

Several features limit the usefulness of this data set for estimating loan cash flows over time. Except for the collections on defaulted loans, the CBO sample of NSLDS loans does not contain a record of borrower payments over time. Similarly, when the sample is drawn each January, only the current level of outstanding principal is recorded. Another problem is that repayment plans are not reported, making it difficult to infer loan lifetimes and to distinguish on-time repayment from prepayment.

## Appendix B

## *Modeling Assumptions*[31]

### Cash Flows

Loans originate at time 0, begin repayment at time $T^R$, and have a maturity of $T^M$ so the loan is repaid in $T^R + T^M$ months. Variable $T^M$ depends on whether the consolidation option is exercised or, in the counterfactual case, the loan term is extended. The original maturity of Stafford loans is ten years. See later in this appendix a description of the stochastic rules governing consolidation and extension.

Interest accrues on outstanding principal every month, except for Subsidized loans when the borrower is in school, deferment, or default. The borrower interest rate in period $t$, denoted $R^j_{S,t}$, is either 0 percent, 6.8 percent, or 6.875 percent, depending on the type and status of the loan.[32]

The variable $P^j_t$ denotes the evolution of principal (prior to default) over time in each simulation $j$. Given an initial principal of $P^j_0 = P_0$, principal evolves according to:

$$P^j_{t+1} = P^j_t[1 + r^j_{S,t}] - A^j_{t+1} \tag{1}$$

where

$$r^j_{S,t} = (1 + R^j_{S,t})^{1/12} - 1 \tag{2}$$

is the monthly compounding student rate. The prescribed monthly payment, $A^j_t$, depends on the loan's status, and is based on amortizing the principal at the current interest rate over the remaining life of the loan:

$$A^j_{t+1} = \begin{cases} \dfrac{P^j_t r^j_{S,t}}{1 - (1 + r^j_{S,t})^{-k}}, & t \geq T^R \\ 0, & t < T^R. \end{cases} \tag{3}$$

31. This appendix uses some of the text, figures, and equations in appendix 2 of Lucas and Moore (2007).

32. The numerical implementation of the model is flexible enough to accommodate floating interest rates tied to particular rates on the yield curve.

Borrowers may pay more or less than this prescribed amount due to default, prepayment, consolidation, deferment, and forbearance. Because we do not have reliable data on actual payments, we assume that borrowers make the prescribed payment unless they default on their loans, prepay their loans in their entirety, defer, or receive forbearance on their loans. In the direct program, the government's cash flows on performing loans are the student loan payments less an administrative charge:

$$A_t^j - fP_t^j, \tag{4}$$

where $f$ is the proportional administrative fee. The fee is 0.50 percent per annum in the benchmark calibration, reflecting typical servicing and other administrative costs of the direct program. In default, the government recovers in proportion to the present value of remaining payments.

In the guaranteed lending program, the government cash flows are the quarterly payments to lenders—the SAP less any consolidation fee paid by lenders to the government—while the loan is in good standing, and the lump sum payment of outstanding principal and accrued interest in the event of default. We ignore administrative costs since they are largely borne by the guaranteed lender.

The quarterly SAP is the difference between the student rate and the three-month commercial paper rate plus a spread, but has a floor of zero. We assume the annualized three-month commercial paper rate, $R_C$, tracks the $t$-bill rate with a 20 basis point spread:

$$R_{C,t}^j = \exp\left[4y^j\left(3k, 3k + \frac{3}{12}\right)\right] + .002 - 1, \forall t = 1, 2, \ldots, T. \tag{5}$$

Absent default, the government cash flow in each month is the SAP less any consolidation fee paid from lenders to the government (1.05 percent of principal). The net guarantee payment to the government is

$$G_t^j = \begin{cases} \dfrac{-P_{3k}^j[R_{C,3k}^j + 1.74\% - R_{S,3k}^j]}{4}, & 3k < T^R \text{ and } 3k < T^C \; \forall k = 0, 1, 2, \ldots \\ \dfrac{-P_{3k}^j[R_{C,3k}^j + 2.34\% - R_{S,3k}^j]}{4}, & 3k \geq T^R \text{ and } 3k < t^C \; \forall k = 0, 1, 2, \ldots \\ \dfrac{-P_{3k}^j([R_{C,3k}^j + 2.64\% - R_{S,3k}^j] - 1.05\%)}{4}, & 3k \geq t^C \; \forall k = 0, 1, 2, \ldots \\ 0, & \textit{otherwise.} \end{cases} \tag{6}$$

In default, the government pays the outstanding principal, $P_t^j$, to the lender, assumes the loan, and recovers in proportion to the present value of the remaining outstanding payments. The default and recovery rates used in the calibration are described in a later section of this appendix.

**Stochastic Rules Governing Borrower Behavior**

Borrowers make a variety of decisions that can dramatically shorten or lengthen the life of their loans, and correspondingly raise or lower their monthly payments. Borrowers do not enter repayment until six months after completing their course of study so loans taken early in the borrower's degree will have longer periods of nonrepayment than loans taken later. Some students shorten or extend the duration of their studies, which adds an uncertain element to the time until a borrower begins repayment. Upon entering repayment, borrowers typically enter a standard ten-year repayment plan but borrowers with larger balances can choose a longer repayment plan of twenty-five years or consolidate their loans into a new loan with terms as long as thirty years. Some borrowers that have left school but take further studies are entitled to payment deferment and borrowers experiencing financial hardship are entitled to loan forbearance. We model the take up of these options using a sample of loans from the NSLDS (as described in appendix A).

In estimating the time before entering repayment, we abstract from the uncertainty and simply assume that all loans experience in-school plus grace period of two years.[33] On the other hand, we assume loan consolidation and loan prepayment behavior are random and sensitive to prevailing interest rates. Prepayment and consolidation may also be related to default rates but, for simplicity, we ignore this. Default rates are discussed in the next section of this appendix.

We posit a rule for the intensity of consolidation for a given loan that is consistent with the Probit model described in appendix A. Specifically, consolidation is decreasing in the student interest rate and decreasing in the time since repayment begins. We assume borrowers consolidate loans during the grace period consistent with the rule for consolidation at other times, but cannot consolidate at all while they are in school.[34] Thus, the annualized probability of consolidation, $q_{C,t}$, at month $t$ is

$$q^{j}_{C,t} = \begin{cases} 0, & t < T^R - 6 \\ \Phi\left(\beta_1 + \beta_2 \max\left(\frac{t - T^R}{12}\right), 0\right), & t \geq T^R, \end{cases} \tag{7}$$

where $\Phi$ is the cumulative standard normal distribution function and $\beta_1$ and $\beta_2$ are loan-type specific parameters, based on probit estimates reported in Lucas and Moore (2007). Table 7A.1 summarizes these parameters for loan type.

Forbearance and deferment rates are likely to exhibit correlation with

33. Averaging the subsidy costs over a distribution of repayment start dates yields similar results when the mean of the distribution is the same as the fixed repayment rate used.

34. For the 2006 academic year, borrowers were allowed to consolidate during their in-school period.

**Table 7A.1 Parameters determining the annual frequency of consolidation**

| Maximum eligible consolidation loan term (loan type) | Model coefficient estimates | | Proportion of loans consolidating over 10 years |
|---|---|---|---|
| | $\beta_1$ | $\beta_2$ | |
| 10 years | –1.94 | –0.03 | 0.16 |
| 20 years | –0.6 | –0.09 | 0.55 |
| 30 years | –0.43 | –0.16 | 0.51 |

both interest rates and borrower default rates, as well as the borrowers' cumulative loan balance. For simplicity, we ignore these correlations and just assume that each year a loan has a 6 percent chance of entering deferment or forbearance for a fixed duration of three years. By assumption, each loan enters deferment or forbearance at most one time, which results in a cumulative ten year rate of deferment and forbearance of approximately 0.55 in base case calibrations. During this period borrowers do not make payments, hence $A_t = 0$ for each period $t$.

**Adjusting Discount Rates for Default Risk**

Under the CIR model, the risk-neutral monthly compounded discount rate, $d_t$, for default free but possibly interest rate contingent monthly cash flows is

$$d_t = \frac{1}{p(t,t + 1/12)} - 1 \ \forall t = 0, 1, 2, \ldots . \tag{8}$$

In both the direct and guaranteed lending programs, the underlying payments between parties are contingent on default. We assume that default occurs with probability $q$ in each month until the borrower completely repays the loan and that default risk is orthogonal to interest rate risk. To establish a simple no-arbitrage pricing mechanism for interest rate and default sensitive cash flows, we suppose there is a pair of simple one-period securities traded in every period. The first is risk free, offering a certain payoff of one dollar in one period's time. The second is a risky claim that pays one dollar if the borrower does not default and $\alpha$ if the borrower does default. The fair price of the default free claim along a particular interest rate simulation path is:[35]

$$\frac{1}{1 + d_t}. \tag{9}$$

With a constant monthly risk premium of $\pi$ and a default probability of $q$, the fair price of the risky claim is:[36]

35. We omit the subscript $j$ in the remainder of this appendix.

36. The probability of default and the risk premium can be time varying, but this is suppressed for simplicity.

$$\frac{1 - q(1 - \alpha)}{(1 + d_t)(1 + \pi)}. \tag{10}$$

More conveniently, we can define state price deflators to value cash flows in $t + 1$ paid if the borrower defaults:

$$\frac{h}{1 + d_t} \tag{11}$$

and if the borrower does not default:

$$\frac{1 - h}{1 + d_t}, \tag{12}$$

where $h$ is the risk-neutral probability of default:

$$h = \frac{\pi + q(1 - \alpha)}{(1 + \pi)(1 - \alpha)}. \tag{13}$$

**Calibrating State Prices for Default Contingent Prices**

Data from the NDSL suggests a cumulative default rate of 15 percent over the life of a typical Stafford loan. Default rates vary over the life of a loan, with the rate decreasing as the loan ages. Abstracting from the time pattern, an annual default rate of 2 percent is consistent with this cumulative experience. Hence, the quarterly default rate, $q$, is set to .25 percent. Estimates from the NSLDS suggest a recovery rate on defaulted loans in the range of 40 to 60 percent. We assume the midpoint of 50 percent in the computation of subsidy cost for the two programs.

**Present Value of Program Cash Flows**

For a given sequence of interest rates, the transition of a loan through defaulting and nondefaulting states can be represented as a binomial tree. Figure 7A.1, panel A, shows borrower payments on a direct loan in a two-period binomial tree. The tree tracks the status of the loan over time, with discrete intervals of time indicated on the horizontal axis. From a given node, each upward move indicates the borrower does not default in the subsequent period, and each downward move corresponds to a borrower default. To ensure a stationary representation, rather than terminate the loan after default, we assume that the borrower and lender agree to a new loan with payments reduced to fraction $\alpha$ of the originally prescribed payments (reflecting failed collections and collection costs).[37] That is, the lender recovers a lump sum proportional to the present value of remaining payments. Cash flows in each state can be priced back to the previous period by using the default and nondefault state prices in equations (26) and (27) and

37. This makes it possible to calibrate the risk premium using the observed loan spread above the risk free rate(s) and the recovery adjusted default rate $q\,(1 - \alpha)$ as in equation (30).

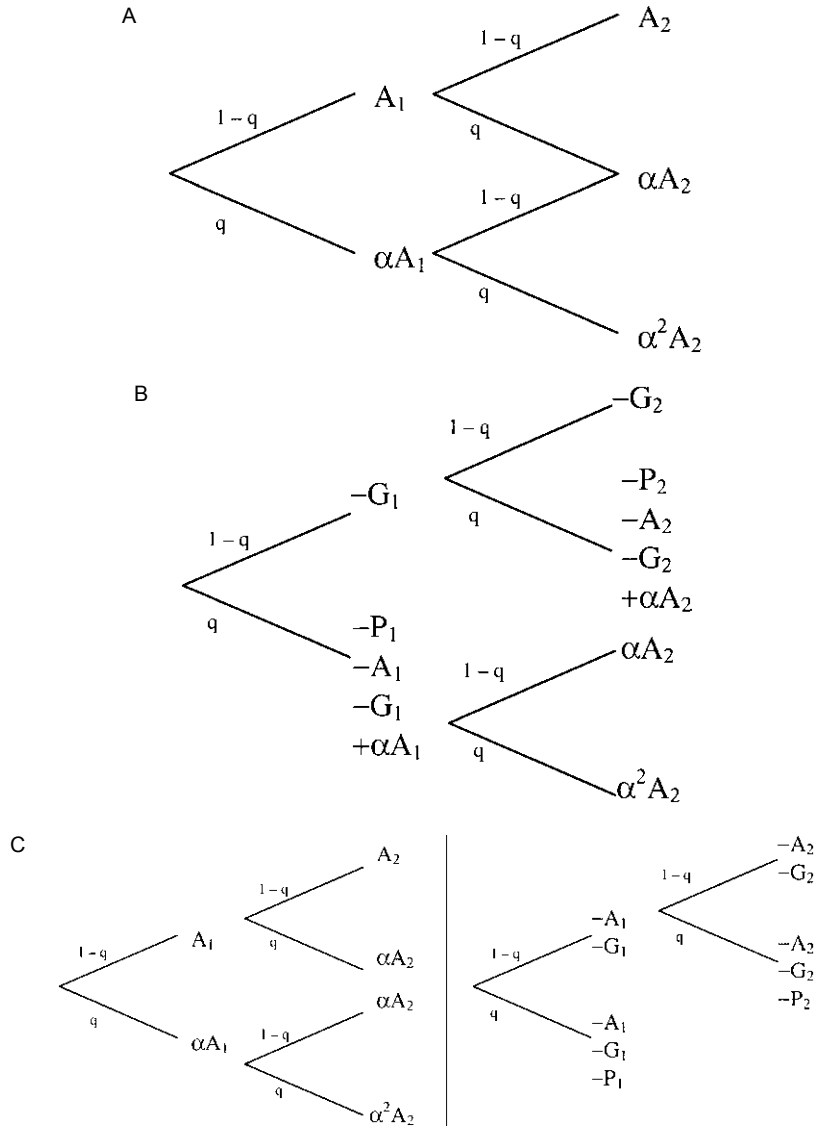


**Fig. 7A.1 Binomial representation for the cash flows of a two-period student loan for a given simulation of interest rates**

to earlier periods by applying (26) and (27) recursively. The present value of loan cash flows is then:

$$\sum_{t=0}^{\infty} \frac{A_t}{\left(\prod_{k=0}^{t-1}(1+d_k)\right)(1+s)^t}, \tag{14}$$

where

$$s = \frac{1 + \pi}{1 - q(1 - \alpha)} - 1. \tag{15}$$

The variable $s$ has an interpretation as the monthly credit spread, which depends on the rate of default ($q$), the rate of recovery ($\alpha$), and the risk premium for credit risk ($\pi$). Assuming the administrative fee is paid only while the loan is not in default (only along the uppermost branches of the binomial tree), the present value of administrative fees is:

$$\sum_{t=0}^{\infty} \frac{(1 - h)^t f P_t^j}{\left(\prod_{k=0}^{t-1} (1 + d_k)\right)}. \tag{16}$$

Thus, the present value of a direct loan is the difference between equation (14) and (16). The cash flows for the guarantee also have a binomial tree representation, as shown in panel B of figure 7A.1 for the two-period case. These cash flows can be decomposed into two simpler binomial trees, as displayed in panel C of figure 7A.1. The first is just the binomial tree for the student loan and the second is a residual that captures the net payments to lenders as described in section 7.5.3. Those lender payments have only two nonzero branches in each period because the loan is assumed to become federal property following default. Valuing the two components of using the risk-neutral discount rates and probabilities of default gives the following present value of cash flows:

$$\begin{aligned} &\sum_{t=0}^{\infty} \frac{A_t}{\left(\prod_{k=0}^{t-1} (1 + d_k)\right)(1 + s)^t} \\ &- \sum_{t=0}^{\infty} \frac{(1 - h)^t (G_t + A_t)}{\left(\prod_{k=0}^{t-1} (1 + d_k)\right)} \\ &- \sum_{t=0}^{\infty} \frac{(1 - h)^{t-1} h(P_t + G_t + A_t)}{\left(\prod_{k=0}^{t-1} (1 + d_k)\right)}. \end{aligned} \tag{17}$$

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## Comment

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This chapter brings rigorous quantitative evaluation to an important policy topic, and hence it is hard to quarrel with either the motivation or the execution. Student lending is important both as a Federal budget item and as a component of household balance sheets (as I argue later). Moreover, student loans are an instrument of access to higher education. Largely as a result of these programs, some prominent researchers argue that financing should no longer be considered a barrier to college enrollment (Carneiro and Heckman 2005). Nonetheless, policymakers should remain vigilant about the cost and efficiency of the programs that provide this access.

The chapter makes three contributions. First, it provides a primer on student lending programs, which are large and ubiquitous in higher education in the United States. Second, the chapter makes an important technical contribution by calculating the cost of student loans in the main federal programs. This is a substantial undertaking because of the complexity

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